12-7-1895

The WPI Volume 11 Issue 11, December 7 1895

Students of Worcester Technical Institute

The Tech.

Vol. XI. Saturday, December 7, 1895. No. 11.

FOOTBALL NUMBER.

CONTENTS.

WORCESTER, MASS.

The Worcester Polytechnic Institute.

Chas. Hamilton, Printer.

INSTITUTE DIRECTORY.

SENIOR CLASS.
President, R. S. Riley; *Vice-President*, C. F. Vaughn; *Secretary*, J. W. Higgins; *Treasurer*, H. T. McClure.

JUNIOR CLASS.
President, E. L. Walker; *Vice-President*, C. F. Day; *Secretary*, E. E. Pease; *Treasurer*, I. G. Keyes; *Historian*, W. W. Braman.

SOPHOMORE CLASS.
President, R. R. Smith; *Vice-President*, W. H. Perkins; *Secretary* W. C. Fuller; *Treasurer*, A. O. Hitchcock.

FRESHMAN CLASS.

CURRENT TOPICS CLUB.
President, A. W. Clement, '95; *Vice-President*, C. C. Chalfant, '97; *Secretary and Treasurer*, H. H. Morse, '97; *Executive Committee*, The Officers and Profs. Cutler and Haynes.

TENNIS ASSOCIATION.
President, H. J. Fuller, '95; *Vice-President*; Philip Goodrich, '96; *Secretary and Treasurer*, G. O. Sanford, '95.

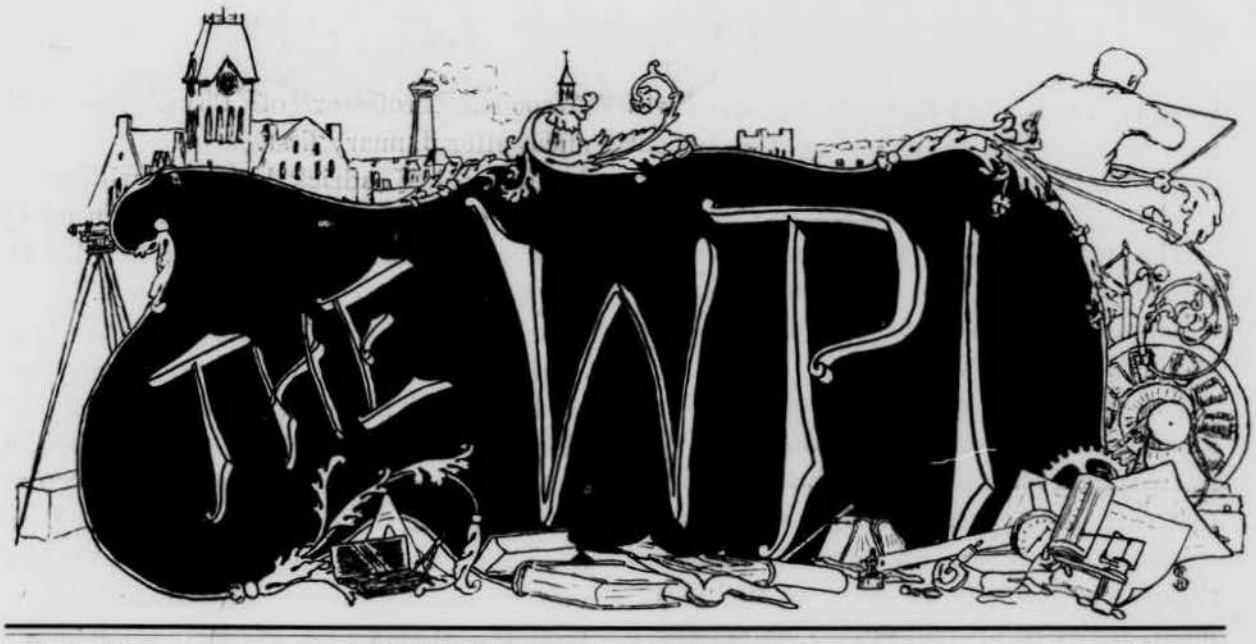
CAMERA CLUB.
President, H. J. Fuller, '95; *Vice-President*, A. L. Smith, '90; *Secretary and Treasurer*, J. W. Higgins, '96.

Y. M. C. A.
President, J. W. Higgins, '96; *Vice-President*, E. H. Willmarth, '97; *Corresponding Secretary*, E. G. Beckwith, '97; *Recording Secretary*, W. B. Bingham, '98; *Treasurer*, A. T. Fuller, '98.

W. E. SOCIETY.
President, A. W. Clement,; *1st Vice-President*, Prof. W. W. Bird; *2nd Vice-President*, P. B. Morgan, '90; *3rd Vice-President*, A. D. Butterfield, '93; *4th Vice-President*, C. D. Parker, '79; *5th Vice-President*, R. H. Taylor, '95; *Secretary*, Prof. G. I. Alden; *Treasurer*, W. F. Cole, '80; *Counsellors*, Dr. E. H. Bigelow, '75; E. H. Whitney, '71; S. M. Green, '85; W. V. Lowe, '81; W. T. Hatch '73.

ATHLETIC ASSOCIATION.
President, F. W. Parks, '96; *Vice-President*, O. W. Lundgren, '97; *Secretary*, H. M. Warren, '96; *Treasurer*, R. S. Riley, '96; *Keeper*, E. G. Beckwith, '97; *Board of Directors*, C. F. Vaughn, '96, C. F. Day, '97, A. O. Hitchcock, '98.

W. P. I. FOOTBALL TEAM.
1895.



Vol. XI. WORCESTER, DECEMBER 7, 1895. No. 11.

The W P I is published by the students of the Worcester Polytechnic Institute on alternate Saturdays during the Institute year. Items of interest are requested from students and alumni of the Institute. All matter must be accompanied by the name of the writer. Subscribers who do not receive their paper regularly, or who make any change of address, will confer a favor by immediately notifying the Business Manager.

Subscription Price is $1.50 Per Annum in advance. Remittance preferred by Money Order or Cash.

Remittances and communications pertaining to business should be addressed to the Business Manager. Address all other communications to the Editor-in-Chief.

Entered at the Post-Office in Worcester, Mass., as second-class matter.

We hope that all friends of the Institute will show their favoritism in a good and fitting manner by voting Worcester the most popular Technical School in the country.

The proposition of the well known firm, Lodge, Davis Co., to present a lathe to the Technical or Mechanical School elected the most popular institution of the kind in the country, is a good one. When one considers the value of the lathe and the mode of election, it is still better. Full particulars of this offer will be found in another column, as will also a letter to Mr. Higgins, which shows what one Tech man has done and is doing in this matter. This is a chance to let the world of business know and hear more of Tech, and it is just such an opportunity that each friend of the Institute should take advantage of at once.

From her birth to the present day the good and welfare of Tech has always been the chief aim of the W P I, and so it is that we feel justified in taking an initial step in this direction. In order to give the students and our subscribers a chance to vote, without any hindrance whatever, we have had some ballots printed. Each subscriber will receive with this issue a postal card addressed to the Lodge, Davis Co. and on the back will be a blank ballot. We therefore wish, and, we think, have right to expect, that each subscriber will fill out this blank, and drop the card in a mail-box, and thus do Worcester Tech a service.

We may not win this prize, but we can at

least try for it. At any rate the lathe will not be excelled in value by the benefit derived by Worcester Tech from this vote.

The report of the first meeting of the Current Topics Club is given in another column, and it seems to us that it is good ground for careful thought.

Doubtless an inopportune time was chosen for the meeting, but the remarks made then are certainly calculated to make one believe that such a society is necessary here. With a single exception, all present expressed themselves strongly in favor of the movement, under one condition. This condition is, "that the students understand, from the beginning, that the society is not a Faculty cudgelled affair."

It is true, to some extent, that last year a few of the students, ones not members of the society however, were firmly convinced that the scheme was nurtured and fostered by certain members of the Faculty, till it became almost a part of them. We say, some men thought this, but they had no ground for such belief. The Current Topics Club is not, was not, and never will be, a Faculty affair. It is managed by the students for the good of all its members, and is related to the Faculty only in so far that a few of its members belong to that body. It is essentially the property of the students. The question, for the students to answer, is how will they dispose of the Current Topics Society. Time only can answer that question, but we hope she will be good to it. Let us all attend the next meeting and show by our presence that we want, nay more, that we will have, this society. Once fairly started, it will live for many a day and be a cause of much benefit and pleasure to all, who attend its meetings.

It is with regret that we announce the resignation of Arthur Kendrick, A.M., Associate Professor of Physics, to take effect after January first.

Professor Kendrick has been with us for over two years, and the vacancy caused by his departure will be a hard one to fill. He has made many friends and very few, if any, enemies among the students or in the city. Such a record is a rare one for a man who held the position he did in an institution of this kind. His methods of instruction, which are very thorough, reflect great credit upon himself. Always ready to hear any complaint, to receive any request or suggestion, and to give advice,—he has, by his kind disposition and scholarly attainments, endeared himself to us all. It is our loss, but the gain of the Rose Polytechnic Institute, that he leaves us now.

We wish Professor Kendrick success in his new field of labor; we extend him our own and the students' congratulations on the success which has always been his as Associate Professor of Physics at this institution.

In our last issue a mistake was made which we take great pleasure in correcting here. The engagement and not the marriage of M. C. Allen, '94, and Miss Anna G. Moore of Worcester is announced. The above mistake was made through no fault of ours. We have repeatedly urged each Alumnus to send us notes for our "Alumni Notes," in order that we may be sure of everything we print in that column.

If Mr. Allen had done this, all would have been well from the outset, and the above mistake would not have occurred. As it was, the editor of "Alumni Notes" was told the above piece of news, which he had every reason to believe was correct, coming as it did from a reliable source. Hence the insertion in our last issue.

We regret this should have occurred, but we cannot refrain from expressing the hope

that this mistake will be a warning to every Alumnus.

We are glad to see that Tech is not alone in her undertaking to publish a volume of verse, as at two colleges, a book similar to ours will soon appear. We refer to "The Verse" of both Trinity College and Brooklyn Tech. Both of these books in all probability will meet with success at their respective colleges, and, in view of this, it may not be out of place for us to state, that we hope "Echoes of Tech Verse" will meet not only with approval, but also with, what is of equal value, a good sale from alumni and students.

As announced in our last issue, this is our annual Football Number. We believe the custom is one which should be handed down to future boards, as it has been to us by our predecessors, and we hope that the Editors of '97 will follow this custom next fall.

We expect in the near future to present to our readers a series of letters from graduates who are pursuing advanced work in Germany and France. These letters will be on general subjects, and unless we are greatly mistaken will be read with much interest.

THE FOOTBALL SEASON OF '95.

A Brief Review.

Now that the season of football, that most glorious of all college sports, is past, a brief summary of the fall's work is not out of place. Many disappointments have the men suffered this year, many difficulties have they struggled through, and yet it is with feelings of pleasure that they look back upon the work of the season. The season was brought to a close prematurely, principally on account of financial reasons, and only five games were played. Two resulted in ties, two in defeats, and one in victory.

When the students began to assemble at the opening of the fall term it was learned that Capt. Brigham, or "Big Brig," as the students termed him, was not coming back this year. This news darkened the hopes of the football men, but they determined to push the clouds away, and so went to work with a vim. H. H. Morse, '97, was elected captain, and with the full confidence and support of the men, got the team together. With only a week's practice an eleven was organized, and on Sept. 21 they lined up against the W. A. team. The game resulted in a tie, 10–10, the Academy scoring when only two minutes of play was left. Tech failed to win the game through lack of defensive practice. The work of the team was considered very creditable, however, in view of the little practice they had done, and the prospects were bright.

Immediately after this game Morse was compelled by the Faculty to resign, and Brown and Smith were prohibited from playing during the rest of the season. This was discouraging to all, and talk of disbanding the team was the topic for a week. The men however rallied, elected Harris, '96, captain, and with only one afternoon of practice during the whole week went to Amherst Sept. 28th and defeated the "Aggies" 16 to 4.

Capt. Harris went to work with a will, and soon had the team on its feet in good shape. October 5th the eleven went to Troy and played a tie game with the R. P. I. team, the score being 6–6.

The game scheduled with Trinity for the 12th had to be cancelled, as the Oval was taken by the New England Athletic Union for the championship games.

October 19th the men lined up against the Newton Athletic team at Newton and were defeated 12–0. Although the first defeat it was one of the most satisfactory games of the season. With a sadly crippled team, and greatly outweighed by their opponents, Tech held down to two touchdowns a team that a week later were beaten by the Chicago A. A. eleven by the small score of 4–0.

October 26th Tech was defeated by Tufts on the Worcester Oval, 10–6. Tech outplayed the team from Medford, and the game was won, not by Tufts' eleven, but by her umpire, who "roasted" Tech in a disgraceful manner.

The game scheduled with W. A. C. for November 2nd ended in a fizzle, and the remainder of the season's games were cancelled by the manager.

One thing which was pleasing to notice this year was the team work developed. The interference was the best ever used by a Tech team, and the defensive work throughout the season was excellent. Although many of this year's players will leave next June the prospects for next year are surely good.

I am very superstitious,
And protest most loudly when
There are thirteen at the table,—
And there's only food for ten. —*Ex.*

'VARSITY MEN ON THE '95 TEAM.

Fred. D. Crawshaw, as manager, has done everything in his power to give the Institute a good football team. Although he has been obliged to buck against great obstacles in the way of small attendance at games, and restrictions by the Faculty, Manager Crawshaw has carried the team through successfully, and winds up the season without becoming "financially embrassed," a rather difficult feat to perform at Worcester Tech. He has had an experienced coach in attendance at practice throughout the season, has paid careful attention to needs of his men on all out-of-town trips, and has worked hard and faithfully in the interests of the eleven all the season.

C. Raymond Harris, '96, captain, hails from Clinton. He is 24 years old, weighs 154 lbs. and stands 5 ft. 10 in. in height. He has played two years on the eleven at right end, but this year, he decided he could be of more service as left halfback. He played a strong game all through the season, following his interference around the end in fine style and bucking the line in the fiercest manner. Harris has had a very arduous task in running the team this season, being obliged to work against very heavy odds. With all the opposition of the Faculty and the scarcity of good material for the team, he has carried the eleven through their schedule in a most faithful manner.

Herbert H. Morse, '97, comes from Southbridge, Mass. His age is 21 years, height 5 ft. 9 in. and weight 158 lbs. This is his second season on the eleven, having previously played a star game on the "scrub." At the beginning of this season he was captain of the team, but was compelled to resign. His position is fullback and his strong point, bucking the line, which he does in the most approved fashion. It is safe to say that he is the strongest line-breaker Tech has had for years. He has played a steady, conscientious game all the season, and will be a great support for next year's team.

R. Sanford Riley, '96, the heaviest man on the team, comes from the City of Winnipeg, Manitoba. He has played in the position of centre rush on the 'Varsity for two years, and is well versed in the duties of his position. He is 6 ft. tall, weighs 193 lbs. and is 21 years of age. He is quite a lively man for his weight, and has kept his opponents on the jump constantly. Owing to his weight and great strength he has become the best man on the team for breaking up interference. His ability in this direction was clearly shown in W. A. C.—Tech '96 game, when he played at left tackle. Riley has been a tower of strength to this year's team, and has been of great aid to the light guards in stopping centre plays. It will doubtless be many years before Tech will see another player as efficient in his position as Riley.

Philip Goodrich, '96, left end, claims Portsmouth as his home. He is 20 years old, weighs 162 lbs. and is 6 ft. tall. Goodrich is very strong and wiry, and many an opposing runner has been brought to earth with great force by his hands. Although this is his first year on the football team, he has shown excellent judgment in his playing. Goodrich is a very speedy runner and has caught several men in his games this year, when they had passed the line and had a clear field before them. He has not been sent with the ball as much as he ought to have been, but when entrusted with it he has usually made his distance.

Arthur H. Durand, '97, has played right tackle on the 'Varsity most of the season. He is 5 ft. 8 in. tall, weighs 158 lbs. and is 25 years old. He was a member of the team of two years ago, but last year was unable to play. Durand is a very strong, aggressive player, and although he invariably runs up against men who weigh more than he does, he is sure to hold his own. He is one of the best players in the line to break through his man and tackle the runner. He received a good football education at the Worcester Academy, where he played four years previous to entering the W. P. I. He will be a mainstay to next year's line.

Frank E. Ross, '96, came to Tech from Barre. This is his first year on the 'Varsity, although he was one of the best players on the second eleven last year. He is 23 years of age, weighs 165 lbs. and is 5 ft. 10 in. in height. He is the lightest guard Tech has had for several years, but by no means the weakest. Ross is exceedingly strong and cordy for a man of his weight, and it is owing to these qualities that he has been able to outplay his many heavier opponents this season. He is a hard, tireless player and holds his grounnd in a very stubborn manner. His place will have to be filled next year.

Alfred O. Hitchcock, '98, is a Fitchburg lad, and plays with the vim and thoughtfulness which is characteristic of all good players. He is 19 years old, weighs 148 lbs. and is but 5 ft. 6 in. tall. He played in very few games this year, but for all that he is one the speediest half-backs in Tech. He necessarily runs very low on account of his small stature, and he plunges into the line with wonderful force for such a small piece of humanity. He follows his interference the closest of any man on the team, and he makes it very difficult for opposing tackles to get at

him. He will undoubtedly put up a star game at half-back next year.

Charles A. Booth, '98, is eighteen years old, six feet tall, and weighs 168 pounds. He hails from Southbridge, Mass., and is a "star" player as tackle, which position he has filled on the left side of the line this season. He is sure to open up a great gap for the backs to pile through, and does not believe in allowing an opponent to gain ground through his position. He is a sure, hard tackler, and generally gets his man back of the opponent's line. He is everywhere on the field, and was one of the most conspicuous players of the team. Last year he was a great ground gainer, but was not given a chance with the ball this year. In the Newton game he played right half, and showed that tackle is not the only position he can fill.

Carl T. Clarke, '98, of Oberlin, Ohio, is twenty years of age, six feet in height, and weighs 172 pounds. He has played in only two games this year as he did not have the time to devote to football. He is an excellent man at tackle, breaking through the line quickly, and is a hard and sure tackler. In practice he is inclined to be a little slow, but in a game no one works harder for victory. His characteristic answer of "you bet!" to all questions requiring an affirmative answer shows his spirit on the gridiron. Last year he played tackle on the Oberlin College team, and he will surely be found in the Tech line-up next season.

Chas. J. Rebboli is another native of Worcester. He is 19 years old, stands 5 ft. 7 in. high, and weighs 152 lbs. He has played quarter-back this season. His star position is half-back, but "Reb" seemed to be the only man Tech could turn into a quarter. He played the position in fine style, always keeping his head when the team was in a tight place, and has been a valuable man to the team. He is a good tackler and gets into the interference invariably. Rebboli played on the High School team several years, being captain of that team last year. He will be found behind Tech's line next season.

J. E. Brown, '97, played right end the greater part of the season. He is a native of Worcester, twenty years old, five feet seven inches in height, and weighs 132 pounds. Although light, he is a quick and strong player, and a sure tackle. In the Newton game "Joe" lined up against Harvard's famous old end rush, "slugger" Mason, and the work he did in that game proves his ability to play the position. Just before the Tufts game Brown broke his collar-bone in practice, and was laid up the rest of the year. This was his first year on the 'Varsity, and his only fault was lack of experience.

Charles F. Vaughn, '96, the right half-back, is a Providence boy. His age is 21 years, height 5 ft. 9½ in. and weight a solid 170 lbs. This is his first year at football, and his playing has been exceptionally fine, considering this fact. He is the fastest runner of any of the backs, and his dashes around the end are a source of delight to the spectators. His weight makes him exceedingly valuable in getting through the opposing tackles, and it is a rare instance when he does not make his distance. He will be very greatly missed on next year's eleven.

Geo. D. Brown, '98, comes from Putnam, Conn., where he played football on the High School eleven. He is twenty-one years old, weighs 164 pounds, and stands five feet nine and one-half inches. He played left end in the first game of the season, and was then compelled to give up the game for the season by action of the Faculty. Brown was a hard worker, but was new at end. He will be a good man for next year's team, and will doubtless make the team as end rush.

S. P. Willis, '99, is a Worcester lad, seventeen years old. He weighs 153 pounds, and is five feet ten inches tall. The first of the season he held the position of quarter-back. His chief fault was slowness in getting the ball back to the runner. Willis, however, is a good tackler, and with practice should play a good game next year.

Wiley H. Perkins comes from Chicopee, Mass., is 19 years old, stands 5 ft. 8 in. and weighs 170 lbs. He has played right guard all the season, and put up a good steady game. Although light in weight for the position, he has been a hard man for the opponents to handle. "Si" is inclined to be slow at times, but loses this tendency during a game. He will probably be found in the line next year.

F. M. Smith, '97, of Worcester, is another man who suffered the ban of the Faculty this year. He was a candidate for end rush, and played tackle in the game with W. A. He is twenty-one years old, stands five feet eight inches in height and weighs 154 pounds. He has played tackle two years on the 'Varsity. He is full of grit, and works honestly for victory and the good of the team.

Fred. W. Parks, '96, of Fitchburg, Mass., is 20 years old, stands 5 ft. 9½ in. tall and weighs 155 lbs. Although this is his first year on the 'Varsity he is an old hand at the game. The first half of the season he played right tackle, and put up a strong aggressive game. He is rather light, but is a quick and "heady" player.

Frank C. Harrington, '98, has been an all-round man this season, having played at guard,

tackle, and end, all of which positions he filled in a creditable manner although he was not kept in the same position long enough to be fairly accustomed to it. He is a Worcester lad, 19 years old, 165 lbs., and is 6 ft. 1 in. in height.

ARSENIC IN GLYCEROL.

By G. E. Barton, '91.

Read at the Springfield Meeting of the American Chemical Society, November, 1895.

In following up the literature of glycerol I find that the first to note the presence of arsenic in the medicinal article was Jahns,[1] but he apparently did not investigate the subject thoroughly.

E. Ritsert[2] was the next to take the subject up. He showed the presence of arsenic in seven samples of medicinal glycerol, by the following test, which he says shows 0.001 mg. in one cc. while the Marsh test shows only 0.01 mg. in one cc. One cc. of glycerol is placed in a small measuring cylinder and to this one cc. of water is added, together with fifteen drops of hydrochloric acid and 0.6 gram zinc. The top of the cylinder is covered with filter-paper, moistened with a 1 : 1 silver nitrate solution or saturated mercuric chloride solution, and a yellow stain is obtained on the paper if arsenic is present. Ritsert also states that ammoniacal silver nitrate solution is a good reagent for arsenious acid and that the arsenious acid present probably explains the difference in the indications given by litmus and phenolphthalein as observed by him. He gives as the probable source of the arsenic found, the sulphuric acid used in the course of manufacture. Issue is taken with G. B. Smith,[3] who states that glycerol itself reduces silver nitrate, and hence ammonio-silver nitrate can not be used to detect arsenic.

An abstract of an article by G. Vulpuis[4] gives the cost of an article free from arsenic as ten per cent. more than the current price.

L. Siebold[5] on "Arsenic in Glycerol," finds from one in 4000 to one in 6000 parts of arsenious acid in glycerol used for perfuming and medicinal purposes, and in one case one part in 2500 parts. All gycerols free from arsenic were traced to one process, described as that "by which as a rule glycerol used for dispensing purposes is understood to be made." He ascribes the presence of arsenic in some cases to the solution of the arsenic present in the glass of the bottle, but this has never been confirmed and hardly seems probable.

Dr. Benno Jaffé[6] attacks the ammonio-silver nitrate test, which he claims to be of no value, as it does not give constant results, either for arsenic or acrolein and similar bodies.

J. Luttké,[7] after an elaborate examination of twenty-one samples, confirms Jaffé's conclusions, and points out as among the disturbing causes, chlorides and organic acids.

There can be no doubt of the presence of arsenic in some glycerol, but I have found no one except Siebold who has attempted to give any idea of the quantity, and while he does not give the method used in obtaining the results stated, I infer from the text that, using either silver nitrate or mercuric chloride to absorb the hydrogen arsenide, he has compared the depth of color obtained with that given by known quantities of arsenious acid. A few experiments led me to think that this cannot be a very accurate method at best, so I set about to apply the method given by Sanger, for the estimation of arsenic in wall paper,[8] which consists of comparing the mirrors obtained in a modified form of the Marsh apparatus with those prepared from known quantities of arsenious oxide in solution as sodium arsenite.

The apparatus as described by Sanger consists of a constant hydrogen generator, filled with chemically pure sulphuric acid and zinc, a smaller reduction flask having a thistle tube for introducing acid and solutions to be treated, and which of course contains a small amount of chemically pure acid and zinc, a drying tube containing calcium chloride, and finally a reduction tube in which the mirror is obtained.

The cost of using chemically pure acid and zinc in the constant hydrogen generator would of course be great, and the first point I turned my attention to was a method for purifying the hydrogen generated by impure acid and zinc so that the constant generator could be run at a reasonable cost. I found that by passing the hydrogen through silver nitrate solution, the arsenic was removed entirely, according to the well-known reaction:

$$AsH_3+6AgNO_3+3H_2O=H_3AsO_3+6HNO_3+3Ag_2.$$

Another improvement in the apparatus as I used it was the substitution of a small separating funnel for the thistle tube in the reduction flask. This prevented the escape of any gas at that point, while the former arrangement allowed a variable quantity to escape.

The apparatus as finally used in this work, consisted of a constant hydrogen generator, using impure acid and zinc, a wash-bottle containing silver nitrate solution, a wash-bottle containing water to remove any traces of silver nitrate solution which the gas might carry mechanically and which would otherwise hold back some of the arsenic in the reduction flask, a reduction flask, with separating funnel as before described, a drying tube containing calcium chloride, and finally the reduction tube.

The efficiency of the silver nitrate solution was proven by running over one hundred hours without obtaining a mirror, whereas a mirror could be obtained in from five to ten minutes from the same hydrogen not passed through silver nitrate. Using the ordinary acid and zinc of the laboratory, I found an amount of silver nitrate solution representing one gram of the salt prevented the formation of a mirror for over two hundred hours.

The mode of operating did not differ essentially from that described by Sanger. The apparatus was first filled with hydrogen, the reduction flask containing at this time only the pure zinc, of which about three grams were used. The jet at the end of the reduction tube was then lit and the tube heated at the proper place, after which a little sulphuric acid was introduced into the reduction flask and the action allowed to go on for a few minutes to prove the purity of the reagents. The solution to be treated was then added and washed in by more acid, or water where the glycerol was added directly to the flask.

The acid used was about one to eight and by slightly varying these proportions it was found possible to get along without cooling the flask. No two samples of zinc were found to contain the same amount of carbon, or at least to dissolve with the same rapidity, so that a careful adjustment of the acid is necessary for each lot, and as large an amount as possible should be granulated at one time. It is also necessary to have standard mirrors made at different speeds to counterbalance the slight differences which are unavoidable.

The calcium chloride tube should be carefully looked after in order that the gas may be perfectly dry. I

have found it best to ignite the article furnished by the makers before using. It is also a good plan to attach the bellows and blow through it a few moments after filling, to remove any slight amount of dust that might otherwise be carried into the reduction tube.

The glass used for the reduction tube should be of the hardest obtainable. I have found great variations in different pieces of the same lot. It would be of advantage if glass were carefully selected, and if necessary carefully tested, could be quoted by dealers, as otherwise a large amount of tubing is accumulated too hard for ordinary work but not hard enough for this purpose. Great care should always be taken to get tubes uniform at the point of deposition, and in spite of this it was found necessary to have several mirrors of each grade.

A small white mirror was found to form beyond the arsenic mirror in those tubes representing small amounts, but in those obtained from larger amounts either wholly or partly coinciding. In the latter case the arsenic mirror took on a totally different color, the characteristic brown of the pure arsenic mirror becoming black. This mirror was without doubt in some cases partly due to moisture, and showed minute drops when examined under a lens. It also seemed to be less with the harder glasses. After having used fresh calcium chloride and the hardest glass obtainable, the only resource is in having standard mirrors representing all possible variations.

Another trouble was found to be the deposition of the arsenic in two mirrors entirely apart. This Gooch and Moseley[9] suggest to be due to the formation of two allotropic forms of arsenic by the too high heating of the reduction tube. They avoid this by enclosing the reduction tube in an iron or nickel jacket. Here again several mirrors of each standard amount are a remedy.

Having obtained a sufficient number of standard mirrors, eight samples of glycerol, such as is ordinarily sold by the druggists of this city were procured. Six represented the best American makers and two were imported.

Five grams of each sample were treated with five cc. of a mixture of thirty parts sulphuric acid and one part nitric acid and the mixture heated carefully with constant stirring till a dry charred mass giving off sulphur dioxide was obtained. This was then allowed to cool and about 10 cc. of water added and then the mass again heated until sulphur dioxide was given off. After cooling, about 15 cc. of water was added and the mixture boiled vigorously to expel sulphur dioxide. The liquid was then filtered off and water added as before, boiled and again filtered. This was repeated twice to insure the complete extraction of the arsenic from the charred mass. The solution thus obtained was added to the reduction flask and the usual process carried out. Five of the eight samples showed arsenic in variable amounts.

To prove that arsenic, if present, would be shown by this course of manipulation, five grams of glycerol showing no arsenic were weighed out and one cc. of an arsenic solution added. This mixture was treated exactly as the other samples had been and no arsenic mirror obtained. From this and the comparison of these mirrors with those obtained by other processes, I concluded that some at least of the samples contain, or are decomposed into, something capable of holding black arsenic. This leads to the query: What is the effect of the combined glycerol present in the toxicological examination for arsenic? May not the trouble with the glycerol be due to a decomposition product which would also be formed in the supposed case? I have had not had time to investigate this important point.

Five grams of the same glycerol used in the previous experiment were then added direct to the reduction flask after diluting with water, and arsenic in small quantities was obtained. One cc. of the arsenic solution was then added to the glycerol and, after diluting, the reduction carried out at once as in the previous experiment and an amount of arsenic equal to that in the one cc. of solution and five grams of glycerol obtained. After trying several plans, this method was finally chosen as both the quickest and most accurate.

The following quantities of arsenious oxide (As_2O_3) were obtained in eight samples:

No.		No.	
1	trace.	5	faint trace.
2	0.08 mg.	6	trace.
3	faint trace.	7	0.004 mg.
4	none.	8	0.003 mg.

To prove that the mirrors obtained were due to arsenic and nothing else, mirrors were heated gently and moist hydrogen sulphide passed through them. In this manner part of the arsenic was changed to the yellow sulphide. Some of the gas from the reduction flask was passed into silver nitrate solution and a black precipitate of metallic silver obtained. On carefully neutralizing with ammonium hydroxide a yellow precipitate of silver arsenite, soluble in excess, and also in nitric acid was obtained. The nitric acid solution was precipitated with hydrochloric acid, a clean copper wire added and the solution warmed. A gray coating formed on the copper. Blank experiments showed the reagents to be pure.

From the above there can be no doubt but that arsenic was present in the glycerols examined.

The method mentioned by several authors, namely, diluting the glycerol with an equal volume of water, adding hydrochloric acid and then metallic zinc, and obtaining a yellow coloration on a filter-paper moistened with either silver nitrate solution (1 : 1) or saturated mercuric chloride solution was tried. A twenty-five cc. measuring cylinder was used and the paper fastened tightly over the mouth, the gas escaping at the nose. In this manner, using the silver nitrate solution, the test was found to be about five times as delicate as the Marsh test used, and a trace of arsenic was found in sample No. 4, which had shown none in the Marsh test. The coloration was not permanent enough, owing to the action of light and other causes, to be compared with standards made with permanent coloring-matters. The test with mercuric chloride, carried out in the same way, was not quite as delicate as the Marsh test. It would hardly be possible by comparing with standards to make this a quantitative method as accurate as the Sanger-Berzelius-Marsh test. It is to be noted that sample No. 2, which showed the largest amount, contained 0.08 arsenious oxide or one part in 62500, while Siebold reports as much as one part in 2500 in one case. Seventy mg. is the smallest dose known to have produced death according to Tanner[10], which would be equivalent to the amount in over four liters of glycerol No. 2, or to 150 cc. of Siebold's worst sample. Although arsenic is slowly eliminated from the system, still it would be quite possible by the indiscriminate use of sample No. 2, for some time, to accumulate enough in the system to cause death. Certainly the above figures are worthy of note by persons using glycerol for medicinal purposes.

So-called C. P. glycerol is often recovered from the waste products of the soap manufactories, and in this

case the presence of arsenic is accounted for as follows: Starting with arsenical oil of vitriol, the arsenic is changed in the hydrochloric acid still to the chloride, which distills over with the acid. On neutralizing the spent lyes with hydrochloric acid the arsenic remains in the solution and is repeatedly distilled over with the glycerol.

In this connection I may say that I found no hydrochloric acid in this laboratory free from arsenic as shown by the yellow stain in the silver nitrate test, but had no trouble in preparing such an article from chemically pure sulphuric acid which I had proven to contain no arsenic.

In conclusion I take pleasure in acknowledging my deep indebtedness to Dr. Charles E. Munroe for his many suggestions.

The Columbian University,
Washington, D. C.

1 Pharm. Ztg., 1888, 652.
2 Pharm. Ztg., 1888, 715, and 1889, 104, 360 and 625.
3 Ned Tijschr, v. Pharm., 1889, 143.
4 Apoth. Zeit., 1889, 4, 459; *J. Soc. Chem. Ind.*, 8, 639.
5 Pharm. J. Trans. [3] 20, 205.
6 Chem. Ztg., 1890, 14, 1493.
7 Apoth. Ztg., 1891, 6, 263.
8 Proc. Amer. Acad., 26, 24.
9 Am. J. Sci., 48, 294.
10 Memoranda of Poisons, p. 69.

ATTENTION!

A Magnificent Offer.

The following notice from a well known firm and a letter from an old Tech will doubtless be of interest.

FREE! FREE! FREE!

$1,500 Lathe Given Away.

On March 1st, 1896, we will present to the Technical or Mechanical School receiving the greatest number of votes a magnificent nickel and gold plated 16-inch Swing Tool-Room Lathe.

This lathe was exhibited by us at the World's Fair in Chicago, and was pronounced by the judges and visitors to be the finest piece of machinery displayed in Machinery Hall.

The entire lathe is nickel plated, with the exception of the bolts, which are gold plated. The inside of the bed is finished in white enamel.

The cabinets are provided with shelves, which are lined with cardinal silk plush.

The cost of this lathe as regularly built is $450.00, and the extra work in preparing, plating, etc., amounted to $1,100.00.

It is not simply "A thing of beauty," but in addition is a Tool-Room Lathe, designed and built with reference to the highest standard of mechanical requirements, and is ready to set up and run.

Everyone in the United States interested in the development of Technical and Mechanical Education is entitled to a vote.

Detailed description of this lathe will be furnished on application.

THE LODGE & DAVIS MACHINE TOOL CO.,
Works: Cincinnati, O., U. S. A.

Popular Ticket.

Votes conforming only to the following conditions will be registered:

1. No duplicate votes from the same party will be registered.
2. No votes will be registered that are received after 12 noon of March 1st, 1896.
3. Name and address of voter must be written in full.
4. Fill in below, name and address of Technical School for which you wish to vote.

Name of Technical School .....
City.....
State.....
Name of Voter.....
City.....
State .....
Date .....

HAMILL FIRE ESCAPE CO.,
F. M. SAVAGE, MANAGER.

CHICAGO, Nov. 21, 1895.

M. P. HIGGINS, ESQ.,
Supt. Washburn Shops, Worcester, Mass.

Dear Sir:—

I enclose to you a card and copy of ballot, which, if you have not already seen, I feel will certainly be of interest to you and especially to your department of the Institute. The W. P. I. already has my vote and I shall try and secure it as many more as possible; and as any one can vote, I think by calling the attention of all "Tech" men to it through the issues of the "W P I," the Institute might be the fortunate school.

I had the pleasure of examining this machine at the World's Fair, and it would certainly be a very nice addition to the Washburn Shops.

Very truly yours,
F. M. SAVAGE,
Non Grad. '92.

A NEW PATH UP TECH HILL.

The necessity for approaching Boynton Hall by the old path, the climbing of which during the winter has been so disagreeable, will soon be a thing of the past. Work is actively progressing on a new one, which, by encircling the hill and approaching the main entrance from the south, will in a great measure avoid the steepness of Tech Hill. For some distance from the gateway the old and the new paths will coincide, but at the foot of the hill the new one will continue around the base of the hill until it reaches a point nearly opposite the east door of the hall, when it will make an abrupt turn across the lawn, thus striking the main driveway about midway between the two entrances. While this plan will make the ascent very much easier, it

will also lengthen the distance to be traversed to some extent.

The path is to be constructed of broken stone and gravel similar to that used in the building of Institute Road, and of cinders obtained at the plant of the Electric Lighting and Power Company. The site for the path, which is to be of practically the same width as the old one, is being excavated to the depth of several feet. A solid foundation of the first named materials will be put in and allowed to settle, and then a thin top layer of cinders will be added and the whole rolled hard. In addition to this, the main driveway is being treated to a general overhauling with a view to securing better drainage and a dryer surface.

While Prof. White, of the Faculty, has direct control of all improvements to the grounds, these are being carried on under the general supervision and at the sole expense of that ever generous benefactor of the Institute, the Hon. Stephen Salisbury.

TECH CAMERA CLUB.

First Meeting a Success.

"How to make a photograph?" was the subject of the first meeting of the Camera Club, which was held in room 13, Boynton Hall, Monday evening, Nov. 25.

President Higgins called the meeting to order, and after speaking briefly of the success of the club, introduced Mr. C. M. Whitney, '97, who performed some interesting experiments on photographic work. Before proceeding with the practical part of the work of the evening, Mr. Whitney read a paper, explaining the main features of photography. The practical work comprised the taking by flash-light of two views of those present. These plates were afterward developed before the company, and then a bromide was made from them, artificial light being used. The results were very satisfactory, and the fifteen or twenty, who climbed Tech hill to attend the meeting, learned many points in the use of the flash-light and bromide paper.

CURRENT TOPICS CLUB.

The Current Topics Club, which was organized a year ago, and which held several successful meetings last winter, held an informal meeting in Prof. Cutler's room, Tuesday afternoon, Nov. 26th, to see if the members were in favor of reorganizing the society or of allowing it to gradually die out, as have many of its predecessors.

The meeting, in the absence of both president and vice-president, was called to order by Secretary Morse. H. W. Jencks, '96, was made chairman *pro tem*. Few members were present, but the general sentiment seemed to be, that the society should be revived, and that several profitable meetings might be held this winter. On account of the small number present, it was deemed advisable to defer the election of officers till the next meeting. A committee of five, comprising F. D. Crawshaw, '96, chairman, R. S. Riley, '96, H. W. Jencks, '96, E. L. Walker, '97, and H. C. Smith, '98, was chosen to present a list of nominations for officers at the next meeting. The same committee was instructed to furnish the subject and scheme for discussion for the next meeting; the date of the next meeting is also to be fixed by this committee. The interest the Faculty have in the society was manifested in the presence of Profs. Cutler, Haynes and Coombs.

PROF. KENDRICK TO LEAVE US.

He Goes to the Rose Polytechnic Institute.

It is announced that Tech is soon to lose Prof. Kendrick, who for over two years has held the position of Associate Professor of Physics.

Professor Kendrick after graduating at Amherst college taught three years at Leicester Academy, when he resigned his position to take a three years' post-graduate course at Harvard. He was later Instructor in Physics in that University. About two years ago he was called to the W. P. I., and has given great satisfaction both to the Institute authorities and to the students. He has recently accepted the position of Associate Professor of Physics at the Rose Polytechnic Institute, Terre Haute, Indiana, where Dr. Mendenhall was located before his connection with the Coast Survey.

This is a decided step in advance for Professor Kendrick, as he will practically have charge of the department of physics in that institution. He will leave Worcester to assume his new duties about January 1st.

CLEVELAND ALUMNI ASSOCIATION.

Semi-Annual Dinner, Dec. 28th.

The Cleveland Alumni Association will hold its semi-annual meeting and dinner at the Hollenden, in that city, ou the night of Saturday, Dec. 28th, and a cordial invitation is extended to all Tech men, who can possibly arrange to be present. As five alumni have located in Cleveland since June last, it is intended to make the meeting a rousing affair in honor of the new arrivals, and a member of the Faculty is expected to be present on behalf of the Institute.

The railroads offer half-rate tickets to and

from Cleveland during holiday week, and it is especially requested that all alumni residing within reaching distance of Cleveland, make it a special point to attend.

COMMUNICATION.

Editor W P I:

I desire to say a few words through your columns, which I consider a very fit medium, on the subject of examinations of steam engineers for licenses.

I am heartily in favor of the principle involved in the act of the legislature passed last winter, and I believe that engineers at present know too little of important points vitally connected with their business. But I must confess, that from what I can learn of the examinations, that some of the questions are of no importance whatever, and as to most of the others, valuable though they might be, it is hardly fair to expect men who never have had particular opportunity to fit themselves in these lines to pass satisfactory examinations. As a particular instance, I know of a case where the question demanded a minute knowledge of a type of engine now obsolete for forty years.

One important thing which Worcester Tech teaches is the value of *experiment*. Under a strict enforcement of the present method of the State officials it seems to me that young technical students will stand more show of obtaining first class licenses, and perhaps the more recently they have left school the better their chances, as they are more in practice in their mathematics. And I say this without any disparagement of the worth of the young technical student.

While I hope and trust in the advantageous working of the law in causing a greater diffusion of knowledge among engineers and a higher standard in engineering, yet I also hope that discretion will be exercised in its carrying out. We must remember that no law is perfect, and that laws cannot make engineers intelligent, conscientious or trustworthy, qualities, it seems, fully as essential as the knowledge, often acquired parrot-like, of how to do mathematical problems. Such qualities cannot be determined by a written or oral examination, but should be carefully considered in the final decree.

Yours very truly,

NORMAN M. PAULL.
W. P. I. '93.

Fairhaven, Mass.

TECHNICALITIES.

The annual catalogue will probably be published about January 1.

Dr. Mendenhall spoke at the Teachers' Convention in this city last week.

John Hurley's turkey was bigger than ever before,—'98 presented it.

Prof. in Physics: "What is a fluid?"
Student: "Anything that runs."

Smoking a class-pipe is a source of great pleasure to '96.

The Sigma game was a great success, from Tech Chapter's point of view.

Smith College and Tech exchanged amenities in several places last week.

Dr. Mendenhall lectured to the Sophomores on Hydrostatics during Prof. Kimball's illness.

M. P. Higgins, Supt. Washburn Shops, has returned from Atlanta.

The engagement of I. F. Williams, Ex-'97, to Miss Ella Searles of Whitinsville is announced.

Several men from the different classes availed themselves of the Thanksgiving recess for extra practice in the Shops.

Lady to student in Tech sweater on the way to a football game: "How soon does this car start? Oh! I beg pardon, I thought you were the conductor!" Exit student in disgust.

Elevator orders have been received from D. Goff and Sons, Pawtucket, R. I.; Daniels, Cornell Co., Worcester; Remington Arms Co., Ilion, N. Y. The orders for grinders continually increase. Three dozen drawing-stands are to be sent to New Jersey.

It is gratifying to note that Dr. Mendenhall is in receipt of more offers for positions for Tech graduates than he can readily fill. If the Alumni would keep him a little more informed concerning their plans and movements it would be possible for some to obtain an opening through him.

Miss Bullock, the library expert, who has been overhauling the library of the Institute, classifying the books and pamphlets, and beginning the work of preparing a card catalogue, left this week. She has completed in a very satisfactory manner the duties originally assigned to her. From this time, the library will continue in charge of Miss Francis.

ALUMNI NOTES.

'94. E. L. Burdick is teacher of Physics and Drawing in Smith Academy, Washington University, St. Louis, Mo.

L. R. Abbott has accepted the position of Instructor in Manual Training at the School for Deaf Mutes, Trenton, New Jersey.

'95. F. J. Bryant is Superintendent of the Mechanical Department at the Atlanta University, Atlanta, Georgia.

THE BROWNIES PLAY FOOTBALL.

All members of the Brownie band,
While trav'ling through this noble land,
In search of all which makes the mind
Keep pace with much advanced mankind,
Came here to Worcester, where 't was said,
Were many who in science led.
So thus it happened that one night
The Brownies came in all their might,
To seek, explore, improve the mind
And body too, if they should find
The means to do it in a way
Which would combine less work than play;
So after glancing o'er the town
One said, "The Tech, of great renown,
Is situated at the north,
And I for one would venture forth
And drink in of their wisdom sound,
Which is of science, most profound!
Both theory and practice, there
The students study, to prepare,
The naughty world to battle in,
So let us of their knowledge win!"
To this suggestion each agreed
And hastened north with Brownie speed,
Until they came to steep Tech hill,
Which even tried the Brownies' skill!
The Salisb'ry labs were visited,
And thro' the shops they quickly sped,
And then the lab mechanical
Which was to them quite mystical
Was hurried thro' with pleasure slight!
The power-house gave some delight;
In each department did they peep,
But found indeed that things too deep
For even Brownies to make out,
Were here lodged safely all about.
The last to hold the strangers small
Was grim and stately Boynton Hall,
Which shared like verdict of the rest,
And so the Brownies went in quest
Of other scenes, the town throughout,
When suddenly there rose a shout
From down the basement, where a few
Had brought the football suits to view,
With footballs, rules, shin-guards and all,
At which they made a joyous call.
Said one, "I think I speak the mind
Of all at this most lucky find;
We 've all heard much about the game,
In which, at college, men win fame,
How those that play wear Samson hair
And never see a barber's chair!
Their ribs they break, their ankles sprain,
So favor with the fair sex gain,
And sympathy from some sweet lass,
And honor, glory, from their class!
When shall we find a better chance
Than offered by this circumstance,
To play the game, as 't should be played,
With each in padded suits arrayed,
With ear-guards, shin-guards, nose-guards, too,
To keep those parts from black and blue!"
At this each Brownie gave consent,
And to the scheme his efforts lent.
Ere long, two teams of Brownies strong
Were chosen from the num'rous throng,
The toughest, heaviest, those who best
In such a game could well contest.
To Bliss's field they hastened fast,
And played the game with pleasure vast;
They punted, bucked the centre, ran
Around the ends, with skilful plan,
A touchdown made, the goal did kick,
Which is a rather clever trick.
Again they tackled, tripped and fell,
Each trampling on another well!
But had the field been free from stones,
Quite smooth and flat (?) no broken bones
Had followed, but the facts are true,
That something more than black and blue
Occurred to some ere play was o'er,
While others yet were stiff and sore,
Yet all declared, and not in jest,
That this of all the games was best,
And there and then arrangements made,
To play again; none did dissuade,
But Bliss's field all thought too rough
For even those most strong and tough,
So we shall never have again,
The Brownie throng to entertain. —T.

A LAMENT.

"You are sad, my son, you are filled with care,"
Said the father to his boy.
"Why do you pull your long dark hair
And seem to be robbed of joy.
Is the work too hard; are the lessons long?
Do you think that you will not pass?
Brace up, my son; come, come, be strong;
You will yet stand well in your class."

"It is not my studies," the student cried,
"That cause me so much pain;
That's not the *end* for which I tried,
Or the place I have worked to gain.
I have given up smoking cigarettes;
I have trained, and it would seem
That with the captain's great regrets,
I've been dropped from the football team."
—*Polytechnic.*

I am waiting, I am longing
For the clever time to come,
When the wind won't blow in winter
And my tailor will not dun,
When exams will be abolished,
When the Freshmen won't be fresh,
When we'll have quite other quarters
In which to eat our noontide mush. —T.